

## Claims

We claim:

1. A plurality of function blocks for use in specifying and performing a  
5 signal analysis function utilizing a plurality of instruments, wherein the plurality of  
instruments comprises two or more virtual instruments (VIs), wherein each function  
block comprises:

a function block icon operable to be displayed in a graphical user interface (GUI)  
of a signal analysis function development environment, wherein the function block icon  
10 visually indicates a respective signal operation; and

a set of program instructions associated with the function icon, wherein the set of  
program instructions are executable to perform the respective signal operation;

wherein each function block is selectable from the plurality of function blocks by  
a user for inclusion in a set of function blocks, and wherein each function block operates  
15 to perform the respective signal operation continuously upon being selected;

wherein each function block is operable to provide a respective output based on  
the respective signal operation, wherein the respective output is operable to be displayed  
in the GUI, provided as input to one or more other ones of the set of function blocks,  
and/or exported to an external device; and

20 wherein the set of function blocks is executable to perform the signal analysis  
function under the signal analysis function development environment using one or more  
of the plurality of instruments.

2. The function blocks of claim 1, wherein the set of function blocks are  
25 displayed in a diagram, wherein the diagram comprises one or more of:

a linear sequence;

a data flow diagram;

a tree diagram; and

a dependency diagram.

3. The function blocks of claim 2,  
wherein the diagram substantially visually represents I/O relationships between  
the function blocks; and

5 wherein, when the I/O relationships between the function blocks change, the  
diagram is automatically updated in accordance with the changed I/O relationships  
between the function blocks.

4. The function blocks of claim 2, wherein the diagram comprises one or  
10 more control structures, wherein the one or more control structures control execution of  
the set of function blocks; and wherein the one or more control structures comprises one  
or more of:

conditional branching; and  
looping;

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5. The function blocks of claim 2, wherein the diagram comprises  
information specifying the respective signal operations of the set of function blocks, and  
wherein the information is executable to perform the signal analysis function under the  
signal analysis function development environment.

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6. The function blocks of claim 5, wherein the information specifying the  
respective signal operations of the set of function blocks is useable to generate a program,  
and wherein the program is executable to perform the signal analysis function  
independently of the signal analysis function development environment.

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7. The function blocks of claim 1, wherein each of at least a subset of the  
plurality of function blocks is operable to:

receive a signal from a signal source;  
perform the respective signal operation on the signal; and

output a result of the respective signal operation for one or more of:  
display in the GUI;  
storage;  
input to another one of the plurality of function blocks; and  
5 export to an external device.

8. The function blocks of claim 1, wherein the set of program instructions are further executable to:

receive user input selecting the function block icon;  
10 display a configuration GUI for the function block; and  
receive user input to the configuration GUI setting one or more parameters of the function block, thereby configuring the function block, wherein the configured function block is operable to perform the signal operation in accordance with the one or more set parameters.

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9. The function blocks of claim 8, wherein each function block has a default configuration, wherein, prior to said configuring the function block, the function block is operable to perform the signal operation in accordance with the default configuration.

20 10. The function blocks of claim 1, wherein at least one of the plurality of function blocks comprises a user-defined function block, and wherein the set of program instructions of the user-defined function block are executable to perform a user-defined signal operation.

25 11. The function blocks of claim 10, wherein the set of program instructions of the user-defined function block comprises a pre-defined program.

12. The function blocks of claim 1,

wherein each function block comprises an input and an output, wherein the input is operable to receive signals from one or more of:

an external signal source;

a file; and/or

5 another function block; and

wherein the output is operable to send resultant signals to one or more of:

a display of the GUI;

an external device;

a file; and/or

10 another, different, function block.

13. The function blocks of claim 1, wherein each function block is operable to display respective indicators for one or both of:

one or more input signals for the function block; and

15 one or more output signals for the function block,

wherein the respective indicators comprise text and/or a graphical image indicating a respective signal.

14. The function blocks of claim 13, wherein each indicator of the function block is selectable by a user to associate the respective signal with:

a display of the GUI, wherein in response to being associated with the display, the respective signal is displayed in the display of the GUI; and/or

a different function block of the set of function blocks, wherein in response to being associated with the different function block, the set of program instructions of the different function block performs the respective signal operation on the respective signal.

15. The function blocks of claim 14, wherein, in being selectable by a user, each indicator is operable to be:

dragged and dropped onto said display of the GUI, resulting in display of the respective signal on the display of the GUI; and/or

dragged and dropped onto the different function block, thereby configuring the different function block to receive the respective signal as input and to perform the  
5     respective signal operation on the respective signal.

16.     The function blocks of claim 14, wherein each function block is operable to receive user input indicating one or more input signals, and wherein the function block is operable to perform the signal operation on the indicated one or more signals in  
10     response to said user input indicating one or more input signals.

17.     The function blocks of claim 16, wherein said user input indicating one or more input signals comprises:

the user dragging and dropping one or more signal icons onto the function block.  
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18.     The function blocks of claim 16,  
wherein the display of the GUI comprises a graph operable to display one or more signals; and

wherein said user input indicating one or more input signals comprises:  
20             the user selecting at least one signal in the GUI display; and  
              the user dragging and dropping a corresponding at least one signal icon from the graph onto the function block, wherein the at least one signal icon represents the at least one signal in the GUI display.

25     19.     The function blocks of claim 1, wherein the two or more virtual instruments comprise at least one of:

a DAQ (data acquisition) device;  
a digitizer;  
an arbitrary waveform generator;

a digital I/O device; and  
a digital multimeter.

20. The function blocks of claim 1, wherein one or more of the two or more  
5 VIs comprises a hardware device, and wherein the hardware device comprises at least one  
of:

a DAQ (data acquisition) board;  
a digitizer board;  
an arbitrary waveform generator board;  
10 a digital I/O board; and  
a digital multimeter board.

21. The function blocks of claim 1, wherein the plurality of instruments  
comprises at least one standalone hardware device.

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22. A memory medium that stores program instructions implementing a  
plurality of function blocks for use in specifying and performing a signal analysis  
function utilizing a plurality of instruments, wherein the plurality of instruments  
20 comprises two or more virtual instruments (VIs), and wherein each function block  
comprises:

a function block icon operable to be displayed in a graphical user interface (GUI)  
of a signal analysis function development environment, wherein the function block icon  
visually indicates a respective signal operation; and

25 a set of program instructions associated with the function icon, wherein the set of  
program instructions are executable to perform the respective signal operation;

wherein each function block is selectable from the plurality of function blocks by  
a user for inclusion in a set of function blocks, and wherein each function block operates  
to perform the respective signal operation continuously upon being selected;

wherein each function block is operable to provide a respective output based on the respective signal operation, wherein the respective output is operable to be displayed in the GUI, provided as input to one or more other ones of the set of function blocks, and/or exported to an external device; and

5        wherein the set of function blocks is executable to perform the signal analysis function under the signal analysis function development environment using one or more of the plurality of instruments.

10        23.    A method for specifying and performing a signal analysis function utilizing a plurality of instruments, wherein the plurality of instruments comprises two or more virtual instruments (VIs), the method comprising:

          receiving first user input selecting a function block from a plurality of function blocks for inclusion in a set of function blocks, wherein the function block corresponds to  
15        a respective signal operation, and wherein the function block comprises a function block icon that visually indicates the respective signal operation and is operable to be displayed in a graphical user interface (GUI) of a signal analysis function development environment, and a set of program instructions associated with the function icon, wherein the set of program instructions are executable to perform the respective signal operation  
20        using at least one of the two or more VIs;

          the function block performing the respective signal operation substantially continuously upon being selected, thereby performing at least a portion of the signal analysis function; and

          the function block providing a respective output based on the respective signal  
25        operation, wherein the respective output is provided for display in the GUI, provided as input to one or more other ones of the set of function blocks, and/or exported to an external device;

wherein the set of function blocks is executable to perform the signal analysis function under the signal analysis function development environment using one or more of the plurality of instruments.

5           24.    The method of claim 23, wherein the program instructions are further executable to implement:

          receiving second user input to the function block invoking display of a configuration GUI for the function block;

          displaying the configuration GUI in response to said receiving second user input;

10          receiving third user input to the configuration GUI specifying values of one or more parameters of the function block, thereby configuring the function block; and

          the function block performing the signal operation in accordance with the one or more parameters.

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